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Journal of the Society of Arts.

FRIDAY, APRIL 18, 1856.

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EIGHTEENTH ORDINARY MEETING,

Wednesday, April, 16, 1856.

The Eighteenth Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 16th inst., Colonel W. H. Sykes, F.R.S., in the Chair.

The following Candidates were balloted for, and duly elected Ordinary Members:—

Babington, Charles Metcalfe, M.D.
Cartwright, Samuel
Hyett, W. H.
Kenworthy, James Lees
Ransford, Henry
Wheen, Richard
Wolrige, J. C.

The paper read was—

ON THREAD OR FIBRE GILDING.

By Francis Bennoch.

When I consented to introduce the subject we are assembled this evening to discuss, I had resolved to confine my observations within the narrow limits of certain recent discoveries, in which I had become interested, but I soon found that, however interesting a paper so limited might be in itself, it would necessarily leave untouched the large and important subject of fibre plating, or covering threads of silk or cotton with gold or silver, so that the precious metals may be used with facility in the manufacture of gold and silver tissues. To clearly understand the several processes required for the production of such fabrics, it became necessary that I should refer to other and apparently distinct branches of industry, such as silver gilding and wire drawing. I therefore resolved to investigate the general subject as deeply as my time would allow, and bring the result of my inquiries within the space of a single address, in which I shall endeavour to describe, as clearly and simply as I can,—

1. The high favour in which such fabrics have been held from time immemorial;
2. The ancient system of manufacture;
3. The system prevailing in the present day, and
4. The new principle of fibre gilding.

I shall not occupy your time with any lengthened or unnecessary reference to its antiquity, because the facts are sufficiently known to all students of profane or sacred history. It is, nevertheless, desirable that some brief reference should be made to the past; my object being to bring together all the important facts, whether ancient or modern, that I have found to bear upon the subject.

The history of ornamental jewellery from the earliest times—the purposes it has served—how and why rings and chains and bracelets, and wreaths and crowns, became and continue indispensable ornaments, would form an instructive paper, and may be taken up by some member connected with that special business; my duty being to confine my remarks to the production of threads used in the manufacture of woven or embroidered fabrics.

Innumerable references are made in the sacred writings to the liberal use of gold and silver, not only for personal adornment, but also for the highest ceremonial purposes.

In the Old Testament we are told (Jer., chap. x., v. 9th) "Silver spread in plates was brought from Tarshish, and Gold from Uphaz, the work of the workmen and of the hands of the founder. Blue and purple is their clothing, they are all the work of cunning men." It is evident from this and other passages that fire was used in purifying the metal; that it was afterwards founded or cast into certain forms, preparatory to its being beaten or hammered, and fitted for the purposes for which it was intended.

I would here remark that, although gold may not now-a-days come from Uphaz or silver from Tarshish, still there is ample evidence in the Scriptures to prove that the precious metals were found in great abundance in those early ages of the world. I would, therefore, humbly suggest the propriety of exploring those regions, for, whenever metal is found in considerable quantities isolated or detached, we may safely conclude that not far removed may be found the same metal in greater masses. The enterprise of the present day scarcely needs a hint, and I merely give utterance to the opinion, that, with our boundless power, untiring energy, and great skill in mining, immense quantities of gold may be discovered in those old and comparatively neglected countries.

The first important use made of gold was in the construction of the Ark of the Covenant, and Bezaleel, the son of Uri, the son of Hur, of the tribe of Judah, is described (Ex. xxxi. verses 2, 3, 4) as specially called, and by inspiration "possessed of all wisdom, understanding, and knowledge in all manner of workmanship, and to devise cunning works in gold, and in silver, and in brass, and in cutting of stones to set them." Then (in the same chapter, v. 38) the *ark* is described as being "overlaid with pure gold within and without."

So in the building of the Temple (1 Kings, chapter vi. verses 21 and 22), "Solomon overlaid the house within with pure gold, and he made a partition of gold before the oracle, and he overlaid it with gold, and he overlaid the whole house with gold, until he had finished all the house, and also the whole altar that was by the oracle he overlaid with gold."

It is interesting and very suggestive to observe, that, wherever the highest and holiest thoughts and purest motives ought to have existed, and where the objects were of the most sacred nature, the purest of all metals was enjoined to be used, and doubtless intended to symbolize the purity of the purposes to which it was applied.

The functions of the priest were the loftiest and purest, and the temple in which he served was designed to last for ever; therefore, the purest metal was adopted as indicative of the purity and endurance of the priesthood and the temple.

After the construction of the ark and the tabernacle we have a description of the garments of the priests (Ex. xxxix. ver. 3)—"And they did beat gold into thin plates, and cut it into wires to work it in the blue, and in the purple, and in the scarlet, and in the fine linen, with cunning work."

As we are not told what breadth the plates were, it would be idle to speculate on the length of the wires. I apprehend, however, that the wires here referred to should not be understood to mean what the word now implies. When we remember the marvellous particularity with which the minutest details in reference to the building of the temple, the tabernacle, the ark, and the woof of the priestly raiment are described, I am persuaded that had the gold been *drawn* into lengthened wires the particulars of the process would have been given. In the absence of such information, and taking the facts as they lie before us, I arrive at the conclusion that the wire mentioned was only narrow shreds of thin gold, which, in all probability, did not exceed the width of the web from which the garments were to be made, and these webs need not have been more than a few inches wide. We shall, by and by, see that even now in the East certain robes are made of narrow stripes, and the fashion may have been handed down from the time of the patriarchs.

From specimens shewn it will be seen that having succeeded in producing a wire of great length, it is used longitudinally as a warp, thus avoiding the difficulty experienced where the wire thread is passed from side to side, as in the weft or shoot.

So also in covering the sacred places within and without with pure gold, we are not informed how the plates were fastened. We very naturally, and I think truthfully believe, that they were rivetted, or fastened with nails, and probably, as regards the mere workmanship, were exceedingly rude; at all events, we are justified in the opinion that had other means been employed they would have been fully described. This view is partly confirmed by the fact that the words "gilt" or "gilding" do not appear in the sacred writings. So far as I am aware, we have no precise data from which we can determine the period when gold was first attached by an adhesive medium; but, for our present object, such a fact is comparatively unimportant.

Although the system adopted in the East, and prevailing there at the present moment, may greatly differ from that which existed in the days of Moses, still in my judgment there must be some similarity. By ascertaining the method now pursued in India, I believe we shall get a glimpse at the plan adopted by the earliest workers in the precious metals.

While I was pursuing my inquiries into this branch of my subject, there appeared, most opportunely, in the *Illustrated London News* of Nov. 10, 1855, a lucid and concise account of the process referred to, which, with gratitude to the writer, and thanks to the proprietor of the *Illustrated News*, whose permission I have to use it in this paper, I will give the details pretty nearly *verbatim*. The communication is dated Ahmednugger, and is signed "B. B."

The city of Paithun, situated on the river Godavery, is famed for its manufactures in gold and silver tissues, viz., pugrees or turbans, doputtas or long shawls, and sarees or women's robes. The highest qualities of these several productions are sent to the courts of Gwalior, Baroda, and Hyderabad.

The long shawls which are thrown over the shoulders of the native princes on all occasions of state ceremonial, frequently cost as much as 3,000 rupees (£300) each. The weft is composed of very fine cotton-thread, generally scarlet or green, the warp being of silk of a similar colour. The shawls are sometimes in long stripes of about an inch in width, and placed alternately a stripe of scarlet and a stripe of gold. The ends are of cloth of gold, about a yard in depth, and the whole shawl is surrounded by a rich border of flowers or birds in variegated silks, woven on a gold ground. Some of the sarees are made of thick shot silk in narrow stripes, and finished in a similar manner; while others of the same texture, as the doputtas, are flowered, spotted, or striped with gold, and are about nine yards in length. They present a most gorgeous appearance being in texture like the fine muslin gauze of ladies' dresses, and it is by no means uncommon to have them of the value of 225 rupees (or £22 10s.) each.

Dr. Royle, in his instructive lecture* on "The Arts and Manufactures of India," informs us that, "among the references to silk in ancient authors, there is also frequently mention made of gold and silver as interwoven with silk; even the Coan women are represented as interweaving gold thread in their silken webs, and Caligula as wearing 'a tunic interwoven with gold.' Babylonicum was the name applied to the splendid productions of the Babylonian looms. These are described as being adorned both with gold and with variously coloured figures. A peacock's train is compared to a figured Babylonicum, enriched with gold; while Peplum, the shawl, had the greatest skill and labour bestowed on its fabrication, and various objects were frequently represented on it; that worn by the Pastophori in religious ceremonies was richly interwoven with gold, and displayed various symbolical and mythological figures; while the Paragauda—a word supposed to be of Oriental origin—we learn was the border of a tunic enriched with gold thread, and worn by ladies. There is no doubt that it has long been the custom so to adorn garments in the East, and we have had numerous such specimens sent to the Exhibition."

Such are the fabrics indispensible to the dignity of Indian princes, specimens of which, by the favour of Colonel Sykes, chairman of the East India Company, I am able to exhibit for the instruction of my audience.

We must now turn to the process employed in the manufacture of the gold thread which forms the basis of these truly magnificent fabrics, and which is more german to the purpose of my address than the fabrics themselves.

A rod of silver, weighing about 22 rupees, or about 8oz., after having been roughened by a file, is covered with a leaf of the best gold, weighing one rupee, so that gold forms one-twenty-third part of the whole metal. The method adopted to make the gold adhere to the silver is very simple. The rod of silver having been wetted, the gold leaf is laid on, and pressed with the fingers, and afterwards rubbed smartly on the thigh. The small portion of gold that may overlap hangs loose, and is cut off; the edges of the gold leaf that come in contact are beaten a little thinner than the body of the leaf, so as to secure, as nearly as possible, an uniform thickness.

The bar so prepared is heated in a pan of charcoal till it becomes red-hot. It is then taken out and hammered, and rubbed with a piece of wood, and is ready to undergo the first process of being drawn into wire. The rod is, at this time, about the thickness of a man's thumb, and from six to eight inches in length. In the wiredrawer's house there is a pit dug in the floor, about thirty inches deep, containing a rude horizontal wooden cylinder, or beam, turning on pivots fixed into each end, placed in sockets at the side or end of the pit. In this cylinder are fixed four handspikes, over one of which is slipped a ring, to which is attached a chain, with a ring at the other end. Through this ring is slipped the head of a pair of pincers, in the jaws of which is placed the end of the gilt bar, which had previously been hammered at one end, so as to enable it to pass through the hole pierced in a steel plate, through which the bar has to be drawn, and, being drawn, is reduced in diameter, and proportionably increased in length. The handles of the pincers being considerably wider than the head, and the ring gripping both handles, it follows that the greater the strain on the handles, the closer the grip of the jaws. The hold is tightened by placing a small piece of mica between the rod and the jaws of the pincers. One man holds the rod steadily and straight to the die, while another man turns the cylinder by pulling with his hands, and pressing with his feet, the handspikes, in the same way as we occasionally see the steersman at the wheel of the rudder of a large ship. As the cylinder revolves, the rod of metal lengthens, and winds round the cylinder. To lessen the friction in passing through the holes, the rod is invariably rubbed over with wax.

Having passed through the holes in the steel plate, each hole being a degree finer than the other, the wire is coiled up and reheated, or annealed, by which it is softened, or made more malleable. Were this precaution omitted, the wire would become brittle and break like cast metal. This process of drawing and heating is repeated over and over again, until the wire is reduced to the substance of ordinary whip cord, and it then passes into other hands. The importance of the division of labour is here recognised. The hands best adapted for the heaviest processes are altogether unfit for the more delicate branches of the business.

The workmen into whose hands the wire is now placed sit at a small bench, on which are two reels or large bobbins a short distance apart, on one of which the wire is wound; midway between them is fixed edgeways a frame, with a steel plate pierced with fifteen or twenty holes of different degress of fineness. To make the wire pass easily through the finer hole, it is rubbed at the end between two pieces of porcelain, then slipped through the hole—caught with a pair of nippers, and attached to a limb or spoke of the empty reel, which is turned by the hand, and the wire is driven through with perfect ease. This operation is continued and repeated until the wire becomes as fine as the finest hair.

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* See Lectures on the Results of the Great Exhibition of 1851; delivered before the Society of Arts. 2 vols., 8vo. Bogue. London, 1852-3.

In this state it cannot be used, for it is too weak to be woven, and must be united with some other fibre before it can be worked in the loom; and being round, it will not readily attach itself to the thread. It therefore becomes necessary that it should be flattened, which is done by beating it with a highly-polished steel hammer, on an anvil equally well polished, as the least flaw would damage the wire.

Eight or ten threads are wound on as many several small reels, like cotton spools. These are placed in two rows, on pegs fastened to a board, so as to turn horizontally. The several ends are passed through a row of small holes pierced in a piece of thick fish skin attached to the anvil with wax—the holes being level with the surface of the anvil.

By these means the gold wires pass on to the anvil separately, yet near each other. The operator seizes all the threads with the left hand, and draws them gently across the anvil, while with the right hand he hammers them as they pass. With one stroke he flattens the eight or ten wires, and with such remarkable skill that scarcely any difference can be detected in the width of the flattened wire, so accurately has each blow been given.

The flattened wire now passes into the hands of a spinner or plater of gold thread. The process is very interesting. The orange coloured silk is wound round two spindles, such as are used for spinning cotton or wool—the ends of the two threads are passed through a ring fastened to the ceiling of the room, and both bobbins are brought to an equal height from the ground; by being rubbed sharply along the thigh they are set in motion in opposite directions, and spin round with great velocity. As they spin, the gilt wire, flattened as described, and guided by the left hand, is wound round the threads with an evenness and regularity almost incredible, considering the rudeness of the implements used; and our surprise is greatly increased on examining the articles afterwards manufactured.

" B. B." concludes with expressing the belief that few (probably no) improvements have been made in the system since the manufacture first began, and he informs us that the greater portion of the inhabitants of Paithun are engaged in the different branches of this manufacture.

In this very concise description of a most interesting branch of industry there are several facts of detail omitted which it would have been well to have had supplied, such as the time occupied in bringing the rod of six inches long into the wire as fine as a hair—the length of the hair so drawn—the value of the labour so condensed, and sundry other points without which we cannot satisfactorily arrive at any economical result. These omissions, however, are amply supplied by the processes adopted in London, and I believe the same or very similar methods prevail in the several cities of Europe where the manufacture of gold lace is encouraged, but I shall confine myself to what I have seen, and in this branch of my paper I am much indebted to the courtesy of Messrs. Johnson, Simpson, and Simons, whose works have been thrown open to me, and to Mr. Simons I am indebted for many of the details I now proceed to give.

Silver being the basis of what is techically called gold thread, it is well to consider what silver is best for the purpose. In this, as in every other metal, there are certain kinds possessing qualities very superior to others. Some are characterised by great tenacity or toughness, suitable for all purposes where that quality is a proved essential. Others are harder, less pliable, and more susceptible of fracture by a sudden concussion, a slight blow being sufficient to break them. The silver in greatest favour with wire-drawers is extracted from lead. This may probably retain a certain portion of the nature of the ore with which it was previously in combination, and may be tougher than that obtained from other mines. The manner in which the silver is separated from the lead is very simple and most interesting. Without detailing the several processes practised by various miners, I need only refer to an improved plan I saw in operation at the lead mines of the Duke of Buccleuch, at Wanlockhead, in the high district of Dumfriesshire. The process is founded on the property which bodies possess of separating from each other during crystallization. The argentiferous lead is melted in a large vessel, and the temperature is arranged to such a point, that the lead becomes crystallized. The crystals of pure lead are then removed as soon as formed, by means of a large iron ladle, pierced with holes, and the silver is thus left combined with a smaller portion of lead, which thus gradually becomes more and more rich, until, by successive operations, it is brought to such a state, that further separation can be advantageously effected by the ordinary means of cupellation.

The facility with which silver can thus be separated from the lead, gives the owner the advantage of making the lead of the required richness. I need hardly tell this audience, that the quality of lead depend. greatly on the quantity of silver combined with its The silver so produced, comes to the market usually in the form of a cake, which I now show you, and is afterwards melted and grained, like this other specimen, in a glass. A certain quantity is weighed—say from 400 to 500 oz.—and placed in a crucible, or, in the common language of the trade, a pot, which is placed in a charcoal fire, and there remains until the metal it contains is of nearly a white heat. The best crucibles for such purposes are, I am informed, of American manufacture, and composed of black lead and a mixture of a peculiar clay. When heated as described, it is ready to be poured into the ingot mould. These moulds are made of iron, and sometimes of copper; but it has been proved by experience that the iron mould is the better of the two. The copper moulds, after being used a given number of times, are liable to fracture. Before pouring the metal into the mould, it is important that the mould itself should be heated to a certain point. Unless this is attended to, steam or gas is generated, and causes a spurting of the metal, producing air-bubbles, or flaws, in the ingot, and any imperfection of that nature produces an ultimate defect in the wire drawn from it. The ingot mould is in two pieces, kept together by very strong clamps and screws, and when the metal is sufficiently set, the screws are loosened, the mould separates, and the ingot of silver falls easily out. The ingot so cast is about 2 inches in diameter, and from 20 to 24 inches in length. The bar, or ingot, is then placed in a charcoal fire until red-hot, whence it is taken and held and turned on the anvil by one man, while three others, with heavy hammers, hammer it well. This beating and hammering continues until the bar is reduced to a size suitable for the first hole or die through which it has to be drawn, and by the hammering is increased in length from 4 to 5 inches, or about 20 per cent. The hammering, so fiercely applied, changes the nature of the metal precisely in the same way as iron is changed by rolling and hammering, laying all the fibres one way, and proportionably increasing its tenacity and elasticity. The bar so prepared is pointed, and made to fit the first die through which it has to pass, and laid on the draw-bench with the point slipped through the die. The point is then seized by the jaws of a pair of monster pincers or draw tongues, with short bow arms, at the end of each of which is a hook that slips over a ring attached to the end of a strong chain cable, drawn by a steam-engine exerting the power of 16 horses. The greater the draught the tighter the grip, and the ingot passes through the first die with the greatest ease, and is reduced in diameter, but increased in length from 10 to 15 per cent. This process is repeated ten or twelve times, each time the rod being drawn through a smaller die. The bar is then removed to another bench, where it is planed so as to remove all roughness or other imperfections on the surface, as the slightest blemish would interfere with perfect gilding, such blemishes being best detected by placing over the bar a sheet of foolscap paper, slightly arched, which by its reflection, shows every speck instantly and most distinctly. The bar of metal, being so prepared, is considerably reduced in weight as well as in size, and is now ready for gilding. As the richness of the wire depends upon the thickness of the gold laid on, and as all the gold leaves are very nearly, if not absolutely, of the same substance, the quality of the wire is regulated by the number of leaves placed one over the other, and these vary from 10 to 30 leaves. The higher qualities are used for military purposes, and pearls and bullions for embroidery. The lower qualities being in demand chiefly for liveries, for the ends of muslins, and also for skein threads exported to India and China. The gold leaves, whether of the depth of 10 or 30, are laid in a row side by side, nearly the length of the bar, on a piece of ordinary cartridge paper; the bar is gently laid on the leaves, pressed close, and the edges of the leaves raised up until the silver is entirely covered with gold leaf; there is no size or foreign matter whatever used; because any such matter would, in the fire, prevent perfect cohesion. Nor is there any water used, as in the Indian process, the natural affinity of the highly polished silver to the gold appears to be sufficient The bar so overspread with leaf, is enveloped in paper and tied tightly round with ley cord and placed in the centre of a heap of lighted charcoal, where it remains until it assumes a bright red heat. One would imagine that the paper must instantly take fire and disappear, but such is not the case. The atmosphere being carefully excluded, it gradually becomes red with the metal, and when the paper has been entirely consumed, the bar is nearly ready to be withdrawn. While red-hot, it is placed on a frame or bench, and vigorously burnished with a blood-stone—a substitute for which, and nearly as good, has been found in a stone discovered in the South Seas, probably the same as that from which the natives of those islands make their spear-heads, hatchets, and weapons of war. This burnishing serves a double purpose; it forces out any air that may have remained between the gold and the silver, and at the same time brings them closer together. When quite smooth, it is permitted to cool gradually.

When quite cool, the surface is covered with wax, and then commences the more rapid reduction of size by drawing the bar through graduated steel dies, highly-polished, as the slightest roughness would damage the metal, and although it might now pass undiscovered, by and by it would show itself in defective wire; so that these slight physical defects, like moral flaws, cannot be always hid, but, sooner or later, will appear on the surface. When reduced to this size, technically called disgrossed, it is annealed, care being taken to exclude the air from the surface, otherwise the gold being now so thin on the silver would partially melt, and present a blackened appearance. After remaining in the fire about an hour, it is placed under other superintendence, and removed to other machinery, moving with greater speed, and rapidly passes through a number of finer holes, each decreasing in size until it is reduced to the size I hold in my hand. After which it is heated and drawn through a hole, which removes all wax and dirt from the surface.

The steel dies are then dispensed with, because, from experience, it was found that the holes were liable to become what wire drawers call square; and until within a comparatively recent period the ounce of metal could not be drawn into more than 900 or 1,000 yards.

One of the firm to which I am so much indebted was, I believe, the first to suggest an experiment with a jewelled die. They experienced many difficulties at first; but all were overcome, and a perforated ruby, set in a metallic frame, such as I now show, answered admirably, and enabled the drawer to produce, from one ounce of metal, a wire a mile and a quarter long—a specimen of which I have here, and you will observe that it is finer than a lady's hair. In connection with this discovery, it is somewhat singular that there are not more than three men in London capable of perforating and setting these ruby dies properly; and one man, who works probably not more than three hours a day on the average, has received from one wire drawing firm as much as £500 or £600 in a single year, while they only pay from 4s. to 5s. for each die.

All the wire is not made so fine as the sample just shown, as the size depends upon the purpose to which it has to be applied. Presuming that the finest point is reached, it is found that the colour is not so rich and deep a shade of yellow as fashion desires.

To effect this a very simple and ingenious plan is adopted. The wire is wound round a copper cylinder, a small portion of wax being added. The bore or cavity of the cylinder is filled with red hot charcoal, made from birch wood, that being found the best; so the wire in its finest state is again annealed; and what appears singular, the colour is deepened and rendered permanent.

So great is the tenacity of even the finest size, that a piece of wire 12 inches long will bear 12 ounces in weight. It is now ready to be flattened preparatory to spinning round the silk, and this is accomplished by winding it from the copper cylinder on to smaller bobbins, ready for the flatting-machine, which is very simple and very small. There are only two rollers for it to pass between, the one being about 10, and the other 4 inches in diameter, and 2 inches wide, slightly convex on the face.

To impress a substance as fine as a hair, and flatten it to twice or treble its original width, requires the nicest possible adaptation of parts. You will not be surprised to hear that a single pair of rolls costs £120. The metal is of the rarest quality of steel, and the polish higher than the finest glass. At one time these rollers were made in Sheffield, but now they are manufactured in Rhenish Prussia.

The wire so flattened is now wound on small bobbins, which are placed in the centre of circular rings, attached to a bar over a spinning frame. On the front of the frame, are bobbins of silk, the threads of which pass through the centre of the ring to which the reel with wire is fixed. The whole is set in motion, and while the thread is being twisted, the ring with the wire revolves round the thread in the opposite direction, and 30 or 40 threads are plated at once—one girl attending to them all—and so the gold thread is finished and ready for any purpose the consumer may require.

In its new form, though only gold is seen, probably nine-tenths of its bulk is silk, while of the remaining one-tenth, only one-fiftieth part is gold—so by labour and ingenuity we are put in possession of a gold thread—of which only one part in five hundred is, in reality, gold.

Let us glance only for a moment at the labour required to reduce the ingot of silver, weighing 420 ounces, to the finished wire, weighing 360 ounces, 60 ounces having been cut off—not destroyed—in the several processes of pointing, planing, and occasional accidental waste:—

	Hours.
To reduce the ingot to the size when it is cut into 10 equal parts, of about 36 ounces each, takes 3 men 20 hours each	60
To reduce from hank to firing off size takes, for each hank, 1 man 5 hours, or for 10 hanks ...	50
To reduce from firing off to 300 yard per ounce size takes, for each hank, 9 hours, or for 10 hanks.	90
To reduce 300 yards to 1,200 yards per ounce size takes, for each hank, 18 hours, or for 10 hanks	180
To reduce from 1,200 yards to 1,800 yards size takes, for each hank, 25 hours, or for 10 hanks	250
If reduced to 2,000 yards, each hank would take at least 7 hours, or for 10 hanks	70
	700

Allowing 10 hours to the day, it would take one man 70 days or 10 weeks to reduce by his labour the ingot of silver, weighing 420 ounces to its finest size. But no one man is equal to the entire duty. The early processes demand the exercise of Titanic powers, while the later processes demand the lightest touch of almost fairy fingers.

In constructing the foregoing table, I have had some difficulty, from the fact that, so far as I can discover, the question has never before been looked at from the labour-consumption point of view. There may be some errors, arising from imperfect information, but I believe it will be found sufficiently accurate to enable us to estimate the labour required to make 400 ounces of gold, in a bar 20 inches long, stretch over 500 miles, and 50 such bars would bind the earth with a golden hoop. But as the 400 ounces of silver is gilt with only eight ounces of gold leaf, each leaf weighing 18 grains, and 4 inches square, it follows that only one-fiftieth part of the wire is gold. So eight ounces of gold in combination with silver is made to stretch 500 miles, or over 60 miles for a single ounce. Nothing can more clearly show the wonderful ductility of this most wonderful metal. One would imagine that in passing through so many holes, the gold would be liable to be scraped from the surface of the silver, but it is not so. In passing through the die every atom of the metal is excited and stretched simultaneously, each atom retaining its relative position. As, from first to last, the wire passes through 100 to 120 dies, it follows that the ingot in its course traverses over 50,000 miles, or twice the circumference of the globe.

Before passing to the last division of this paper, a few observations may be permitted, marking the differences that exist between manual and mechanical labour, as suggested by the Indian and English processes of wire drawing.

In London, I believe that 500 ounces of metal could be drawn into wire while 10 are drawn at Paithun.

In London, it can be drawn 2,000 or even 2,200 yards to the ounce, while in Paithun they stop short of 1,000 or 1,200 yards.

In London, the manufacturer depends upon mechanical ingenuity, which enables comparative children to execute a very large proportion of the work, while in India age and great experience are essential to the production of a marketable commodity.

The difference, in my judgment, will increase year by year. Electro-gilding in some way or other must, sooner or later, supersede the present process. Whether its application shall be to the bar of silver in bulk, or to the completed wire, I am not sufficiently skilled in chemistry, nor sufficiently acquainted with wire-drawing, to determine; but looking at the conditions of the trade, and considering the scientific principles involved and the chemical processes that may be applied, I have no more doubt of the result desired being accomplished than I have in my own existence.

Certain it is, that ere long, English industry will supply India, and probably China, with all the prepared thread they require for the production of their sumptuous robes; my only surprise is, that English enterprise and English looms have not long ago supplied those distant countries with the manufactured article.

When we consider the consumption of the precious metals—the no less precious money, and the still more precious labour consumed in the manufacture of gold thread, it is not only not satisfactory, but very humiliating, to confess that a very large proportion of the quantity produced is flung away and wasted, much being consumed in bars of gold shot in at the ends of webs of muslin or other cloth, to produce an attractive finish, which, when purchased for consumption, is torn off and cast into the fire.

Having entered so fully into the details of wire drawing, flatting, and spinning, I imagine that my audience will now, by analogy, more closely apprehend the various principles and processes bound up in the new and patented plan of

Fibre Gilding.

For many years chemists have attempted every known method of gilding, in the hope of discovering some process by which silk, or other fibre, could be gilded without applying the immense labour, seen to be necessary, before a thread with a covering of gold can be used with facility in the loom, and woven into cloth—but they always failed. In France, where scientific research is liberally promoted by the Government, a large reward was offered for a successful plan, but no man ever had the opportunity, or satisfaction of claiming it. The electro process gave a fresh impulse to scientific men.

The difficulties of the first stage were soon overcome, and gold was compelled to attach itself to the surface of the thread. Here a new difficulty arose—the thread, being completely soaked, was long in drying, and when dried, had lost its lustre; while the foundation on which the gold rested was so soft and flimsy, that to burnish it was impossible. They only produced a gold thread which had not the effect of gold, and was therefore useless. Among the several investigators was Mr. Albert Hock, who, failing to find in chemistry the principle by which fibres could be gilded, succeeded by means of a simple mechanical contrivance.

I have more than ever felt to-night how difficult it is to find words calculated to explain the simplest mechanical movement, and now the difficulty is increased a hundred-fold. I intended to have constructed a small model machine, but that I found utterly impracticable in the time I had given myself to collect facts and prepare this paper; I must, therefore, endeavour to make words supply the place of a machine, and if I fail in making you understand the method, I shall, through your eyes, convince you that the work has been done, by exhibiting shawls, and other specimens of manufacture, from material so produced. In the first place, it is essential that the silk used should be of a superior quality, free from knotty nibs and rough places. The gum must be boiled out of the silk, and then the silk tinged to the shade of a light orange, of which I show you a sample; it is then wound on bobbins, as you see—the bobbins are placed on a wire, on which they revolve when gently pulled. The end of the thread is is passed over a wire, and then under a roller, which works in a trough containing a glutinous but transparent liquid. It then passes over a reel attached to an endless screw or threaded spindle, so arranged that it lays on a brass cylinder the thread of silk as close as cords are wound round the handle of a whip, without overlapping, until the cylinder is completely covered with the silk, when the thread is broken; the length of the skein of thread depends, therefore, upon the size of the cylinder and the fineness of the thread, but the cylinder cannot be increased beyond a certain size, and that size must not be larger than can be spanned by a single leaf of gold, and the gold-beaters will not produce it larger than 3⅝ths of an inch square. When we required the leaf to be beaten 4 inches square, the gold-beater declined the order, advancing as a reason, that, were he to demand such a size, every journeyman he had would strike and leave him. So we had to get the gold leaf from France, another instance of the mischief done to commerce by trade combinations.

The cylinder being covered with silk in a gummy state, the book with the gold leaf is opened and laid on the palm of the hand; the machine—something like a turning lathe—is moved; the edge of the leaf is made to touch the gummed silk, and it is quickly drawn round the cylinder covering the silk. This is repeated until the entire surface of the roller is covered with gold leaf. A piece of cloth or washed leather is fastened on a slip of wood, something like a razor-strop. The roller is turned round and the strop pressed firmly upon the leaf, which not only presses the leaf closer to the silk, but separates the leaf between each of the windings of the finest thread. Thus one side of the finest thread is gilded. It is thus apparent that if gold and green, or any other colour, is desired in combination with gold, we have only, first, to dye the thread the colour we require, and then, by gilding one side, we secure the combination wished. To gild the entire thread we have only to wind the half-gilded thread on to another roller. The gilded side of the silk thread necessarily winds next to the brass on the second roller, leaving the un-gilt part of the thread exposed, and ready to be treated in the same manner as before described, and so the process is completed. It is then wound on to reels of the usual size, and permitted to dry thoroughly. After this it is reeled on boards, or, as the French call them, planchettes, in the manner of the samples exhibited, and is ready for the market. The colour, you will observe, is very beautiful, being the natural colour of the gold leaf. The great advantage of this over every other thread is its lightness and perfect flexibility, for it can be wound and woven wherever any other thread can be wound or woven. Its only disadvantage consists in the impossibility of producing by this process, that tinselled and glaring effect which ladies seem to consider a prime essential wherever gold is used. In reality it is a new but very expensive colour. The sizes of the threads are regulated by the number of ends of silk wound round the roller at once. The substance used for attaching the gold leaf to the threads, unites them at the same time, and brings them into one thread.

Thus No. 2 means two threads, No. 3 three threads, gilded together.

As regards cost it is, size for size, considerably dearer than the ordinary gold thread, but as it measures a much greater length for the weight, it virtually becomes, for weaving purposes, very much cheaper. The finest ordinary gold thread measures about 550 yards to the ounce, and costs about 8s. A similar size of gilded silk, weighing one-third the weight, and measuring the same, would not cost over 5s. Where fine gold leaf is used it is untarnishable, but copper can be used with the same facility as gold, and comes at little more than half the price, while for ordinary purposes it answers quite as well. The shawls I shall exhibit are made from fine gold. The gauze scarfs are made from copper, and the difference can scarcely be detected.

In France there is a considerable demand for, and a steadily increasing consumption of, the material. Whether the manufacturers of England will enter the lists, and endeavour to compete with their enterprising neighbours, is more that I can tell. I only know that the patentees, after spending large sums in perfecting the principle, have so far received less encouragement than they had a right to expect from the manufacturers of the United Kingdom.

There is one advantage in fabrics composed of this gilded silk, which cannot fail to be appreciated hereafter, and that is, their exceeding lightness when compared with productions from the old class of material; and you will observe that, as respects brilliancy, there is little, if any, difference. Wherever fine gold is used it will never tarnish.

My task is done. I have as concisely as possible brought together all the facts relating to the several processes of plating and gilding fibres. In pursuing my inquiries, I could not but remark the immense labour and patient industry devoted solely to the indulgence of luxurious tastes. This idea will, doubtless have flitted across the minds of many of my audience; nor do I lament and bewail, as some do, the amount of money expended in gratifying those desires. To confine one's attention to the mere necessaries and utilities of life would be to rob existence of many of its loftiest pleasures. The subject to which our attention has been directed this evening cannot be considered as partaking of the high qualities referred to, still, it is novel as well as interesting,—and although I can hardly expect the information derived will fully compensate for the time expended, I, nevertheless, hope you will not consider the time we have been together as an hour altogether wasted.

DISCUSSION.

Dr. **Forbes Royle**, F.R.S. said, the first expression was one of admiration of the beautiful invention of Mr. Bennoch, and the very admirable way in which it had been adapted to the old manufactures of the East. He would confine his observations to the Indian fabrics, to which alone he had paid attention. In the first place one could not but be struck, the more the inventions and the manufactures of the natives of the East were investigated, with admiration at the ingenuity with which they discovered, at very early periods of the civilisation of the world, those different modes of fabrication. Although machinery here had carried these out to a marvellous extent, the principles of these Indian manufacturers had been adopted. There could be no doubt that gold had been used for these purposes in the East from the earliest ages, as was evident from the Rig Veda. Wire drawing, as was apparent from what they had seen and heard that evening, could have been discovered only in a country where steel was also known. In India steel was known at very early periods. In Persia, the nearest country to it, which was early civilised, they had a proverb, in which, "to give an Indian's answer," meant "a cut with a sword made of Indian steel. This alone would prove the early period at which Indian steel was known in the countries of the East; the Damascus blades were considered to have been made of the same material. Mr. Bennoch had referred to an article lately published in the *Illustrated London News*, but he would find in the catalogue of the Exhibition of 1851, a description of the drawing of this gilt wire, nearly as minute as that given in the publication referred to, without, however, the advantages of the illustrations, which gave so good an idea of the simple methods by which the natives of the East attained the same ends as were effected in this country by means of complicated machinery. The Indians, at Boorhampore, washed both their gold and silver with lime juice and water, in order to give them a perfectly clean surface before they brought them into contact with each other. There could be no doubt that the discovery of this wire-drawing was due to the natives of India, although Beckman, in his "History of Inventions," ascribed it to the Germans of Nuremberg. But if we looked to the mode of drawing gold and silver wire, as practised in India, and the curious way in which the last link of the chain was made to lay hold of the handles of the pincers, as well as the necessity of having good steel dies or plates, all the same as had long existed in, and was now practised in, many parts of India, there could be little doubt of its being the original country of the invention, especially as it was not known till the fourteenth century in Europe, when so many Europeans travelled to the East. With regard to what Mr. Bennoch had said about some of the specimens before them being the products of Europe, it was difficult to determine that question in all cases. He could only say if the flattened gilt wires were of European make, the manufacturer had been ingenious enough to tie up the skeins with Indian cotton. He (Dr. Royle) thought, notwithstanding the regularity of the fabrics, they were all of Indian produce. If they examined the skill with which the silk thread was covered with the gold, nothing was more astonishing than the great regularity with which this was done, although it was effected in the way described, that is, by covering the silk while it was twirling round, by merely holding the flattened wire in the hand. But an Indian sage had described the human hand as the best of all instruments. Sometimes, with the view of deadening the lustre, and producing the softened effect so much admired in Eastern productions, the thread was only partially wound with the gilded or the silver wire. The committees of India for the Great Exhibition were directed to send only the productions of their own districts. Hence some long pieces of magnificent gold lace, of different patterns, were sent from Agra, where it was extensively manufactured for the army. He repeated his opinion, that the great majority of the specimens before them were Indian productions. The skill with which the silk was gilded was of great use in weaving gold into their rich fabrics. In the gorgeous specimens before them (alluding to the robes exhibited, the property of the East India Company) they had specimens both of the flattened wire and of silk covered both with silver and with gilt wire. The softened effect of one part was produced by the covered silk with fine wire, and contrasted well with the other parts in which the glistening effect of the flattened metal alone was obtained. The only other observation he would make was, that notwithstanding the ingenuity of Mr. Bennoch in gilding fibres, the natives of India had come extremely near the invention in gilding cotton, as was evinced in the specimens of gold printing upon calico and muslin which he produced, and which were very beautiful. The fibres were perfectly flexible, and sustained no injury from being crumpled up. This was a process which was carried on in many parts of India, where there was a sufficient amount of population to create a demand for such articles; and it was another instance of the ingenuity with which they had discovered so many of these manufactures. He had no doubt they would be able to make use of Mr. Bennoch's gilded thread, which would suit many of their fabrics, especially as they had not to import the taste to work them up into harmonious designs.

The **Chairman**, in offering his acknowledgments, and he was sure those of the Society of Arts, to Mr. Bennoch for his elaborate and lucid explanation of the modes of preparing gold or silver threads or fibres and their employment in woven fabrics, would take advantage of Mr. Bennoch's concluding observations, on the apparently small interest manifested by the manufacturers of England in such products, to state that the existing commercial relations between England and India were such as to demand the most active ingenuity on the part of the manufacturers of England to produce marketable goods of a new character for India, with a view to lessen the perennial drain from England of the precious metals, to adjust the annual balance of trade in favour of India. The facts were, that the export trade from England to India would seem to have attained its maximum for the last three or four years; while the export trade from India was gradually and steadily increasing, leaving a yearly increasing balance of trade in favour of India. Comparing two periods of the trade of India, 1834 to 1835, to 1841 to 1842 inclusive; with 1849 to 1850, to 1853 to 1854 inclusive; at the end of the first period, the balance of trade in favour of India was nearly forty-seven millions sterling, averaging nearly six millions per annum—this was partly liquidated by fifteen millions of bullion sent out, partly by the receipt of fourteen millions sterling into the East India Company's treasury in London, for which bills were given in India, and partly by other means. In the last period of five years, the balance in favour of India was nearly forty millions sterling, averaging nearly eight millions per annum. About nineteen millions of bullion were sent to liquidate this debt, or three and three-quarter millions per annum; the East India Company granted bills on India for sixteen millions, about three and a quarter millions annually, and about four and three-quarter millions remained to be paid by other modes. Now, in this state of the Indian trade, it would seem to be worthy the consideration of manufacturers in Europe whether they could send new products to lessen the large payments in bullion. The fabrics which had been exhibited to the Society that night, Pugrees, Sarhees, Doputtas, and Chookees, were worn by 150 millions of people, male and female, in India, and were manufactured entirely in India. Why should not our manufacturers at a less cost, by the aid of machinery, imitate these fabrics and pay for Indian products in these goods instead of bullion? There was a jargon abroad about the necessity for developing the resources of India; but the truth was, that at present the development was of that nature that the products of Indian industry could not be paid for by the products of the industry of other countries; and adjustments could only be effected by the employment of unusual amounts of the precious metals.

Mr. **Bennoch** having briefly returned thanks,

The Secretary announced that the paper to be read on the evening of Wednesday next, the 23rd instant, was "On Photo-Galvanography, or Engraving by Light and Electricity," by Herr Paul Pretsch. On this evening Roger Fenton, Esq. will preside.

THE EXAMINATIONS.

It having been represented to the Council, by several Institutions, that there does not exist in them classes for systematic instruction, but that some of the members of the Institutions are anxious to be allowed to compete at the ensuing examinations in June next, the Council have determined to suspend for the present the rule requiring all candidates to be members of classes at an Institute, but it will be absolutely necessary that every candidate should be at least a member of an Institute in Union.

Mr. Astrup Cariss, Secretary to the Liverpool Institute, in a letter to the Secretary of the Society of Arts on this subject says:—"I will here observe that Dr. Hudson's statement at the late meeting of the Institutional Association of Lancashire and Cheshire (at Manchester), to the effect that we consider our certificates of our pupils' progress as valuable as any which you are likely to give, was wholly unfounded. I do not mean by this to say what the opinion of our directors is as to the comparative value of our certificates and yours, but merely that nothing has transpired to authorise his statement. And, whatever may be the opinion of our directors on this point, they have at all events heartily approved of your scheme, and, following the example of the Leeds Institute, granted to the school committees £20 towards the expense of sending up a limited number of pupils who may satisfactorily pass a preliminary examination here."

Colonial Correspondence.

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THE COMMERCIAL IMPORTANCE OF HONDURAS AS A BRITISH SETTLEMENT.

Belize, British Honduras
March 15th, 1856.

Sir,—I have, on previous occasions, brought under your notice different kinds of fibre, the productions of Yucatan, British Honduras, and Tehuantepec. That which appeared to me to be the most valuable was what is called in this country the silk grass. The plant from which it is produced grows spontaneously in marshy, shaded grounds, which we do not lack in this highly-favoured region, in very great plenty. I now send you another species of fibre, which I have received from the island of Ruatan—it is made from the stalk of the plantain tree. It is calculated that every stem will average about a pound of fibre; and as the trees in that island are much cultivated for the sake of the fruit, which is exported to New Orleans, this article, if of any value, would form a very important addition to its trade.

Whilst on the subject of the productions of Ruatan, one of the Bay Islands, perhaps I may be permitted to say a word or two in reference to that famous treaty, which will be known to future ages by the name of the Bulwer and Clayton, or the Clayton and Bulwer, according as it is spoken or written of by an Englishman or an American, about which our most esteemed friend and brother

Jonathan is erecting his quills so fiercely. He says that the British Government have violated that treaty, and he calls for a specific performance of all its articles, which performance, according to his interpretation, will involve the necessity of the English immediately quitting the shores of British Honduras, and giving up possession of the Bay Islands, that is Ruatan, Bonacca, and Utila. As a loyal subject of her most gracious Majesty Queen Victoria, and occupying a certain public position in this "Worthless Settlement," as the *Times* is pleased to call it, but in my opinion erroneously, I should like to put in a word or two on the subject.

Looking at the treaty as a legal document, construing it as I would construe a deed, a will, or an Act of Parliament, I unhesitatingly say that the treaty has not been violated in one single tittle. What was the design, intent, and object of the treaty? I will endeavour to show. Since the discovery of gold in California it has become an object of the utmost importance to the Americans to establish a shorter route to that part of the Union than the oceanic one by Cape Horn, and a less expensive one than the land transit across the Isthmus of Panama or Darien. The British Government, although not equally interested in such an undertaking, but viewing with a liberal spirit the contemplation of so noble a work, which would unite two oceans, and bring the productions of two parts of the world, at present so far apart, so much nearer to each other, and which would be so beneficial to commerce in general, cordially entered into the scheme, and offered to the Americans a hearty co-operation. It must, however, be borne in mind that the successful termination of such an undertaking would be to the United States a particular, immediate, and certain benefit, whilst to Great Britain it would be general, remote, and contingent. Various plans have been proposed. A railway across the Isthmus of Panama, a ship canal across the Isthmus of Darien, a railway across the Isthmus of Tehuantepec, a ship canal by the river St. Juan, and through the lake of Nicaragua, and lastly, a railway across the state of Honduras, which should commence at Port Caballos, in the bay of Honduras, on the Atlantic side, and terminate in the bay of Fonseca, on the Pacific side. Not one of these works has as yet been begun, or is ever likely to be, except the Panama Railway, and that, I believe, is nearly finished. There are physical difficulties connected with all these projects which cannot be overcome, and to which it is not necessary at the present moment to do more than allude. For the purpose of carrying out one of these schemes, but more particularly the ship canal across the Isthmus of Darien, in a fair and impartial manner, the United States Government, and that of Great Britain, determined to enter into a treaty, and they did enter into a treaty, and that treaty was negotiated on the one side by Sir Henry Bulwer, her Britannic Majesty's minister at Washington, and by Mr. Clayton, the organ of the Government of the United States, on the other. Mr. Clayton, Mr. Cass, Mr. Seward, and many other distinguished Americans, members of the Senate and of Congress, men of ability, of eloquence, of experience, and of honourable minds, say that by that treaty we engaged to evacuate the "Belize Settlement," as they call it, to give up possession of the Bay Islands, and to abandon the protectorate of the Mosquito kingdom. *I* say that by that treaty we are not called upon *to do anything of the kind,* as I hope presently to be able to show very clearly.

What did the contracting parties bind themselves to do or not to do by that treaty? They proposed to bind themselves not to acquire any *new* territory,—they did not propose to give up any which either of them *already possessed.* They contemplated the execution of a great public work, and they entered into a treaty, the intent and meaning of which were, that neither the one nor the other should *hereafter* acquire any territory, possession, or anything else which could give either an exclusive control over that work. They bound themselves, then, to abstain from all acquisition of territory—not on the Monro principle, because America was a party, but in order that neither of them should have a monopoly of the canal which they proposed to construct. Now, there can be no doubt whatever that that canal would have been far more beneficial to America than to Great Britain, and, that being the case, is it consistent with common sense that the latter power should come forward and say, "This canal will be of great benefit to you. It will enable you to arrive at your gold fields in California by a comparatively short route. We are rejoiced to be permitted to have the honour of co-operating with you in such a magnificent work, which will be a more durable memento than any Greek or Roman monument; but, lest you should suppose that we wish to have an unfair share of the advantages which will flow from it,—or, indeed, any share at all—we not only faithfully promise that we will not obtain any new territory in its vicinity, but we freely give up the settlement of Honduras, which we have had in our possession for the last 200 years; we make you a present of the Bay Islands, and for the future his sacred Majesty, George-Augustus Frederick, king of the Cannibal—we beg pardon—king of all the Mosquitos, must take care of himself." Would this, I say, be consistent with common sense? There is not a tailor in Lothbury, nor a haberdasher in Ludgate, who would not say "that it did not stand to reason." What does the article of the treaty which we are accused of having violated, say? "The governments of the United States and Great Britain hereby declare, that neither the one nor the other will ever obtain, or maintain for itself, any exclusive control over the said ship canal." Here, then, the object of the treaty is plainly stated, "That neither the one, nor the other will obtain exclusive control over the said canal." "Agreeing," having that object in view, and for that purpose, "agreeing that neither will erect or maintain any fortifications *commanding the same, or in the vicinity thereof.*" Have we erected any such fortifications commanding such canal? That, I should think, even Mr. Cass would not say, as the canal itself does not exist, and it is more than probable that it never will. Well, then, we have not violated that part of the treaty. It goes on—still in the future tense,—"or occupy, or fortify, or colonise, or assume, or exercise any dominion over Nicaragua, Costa Rica, the Mosquito coast, or any part of Central America." Have we done that? I say, no. Central America consists of five states, viz., Nicaragua, Costa Rica, San Salvador, Guatimala, and Honduras. Only two of these states being mentioned in the treaty, the words "or any part of Central America" signify "or any of the other states," that is Guatimala, San Salvador, or Honduras. This clause must be construed according to its obvious meaning. The term Central America has always been confined to the states above mentioned. A native of Central America is always understood to mean a native from those states. In this article there is not one word mentioned about the relinquishment of dominion,—it is confined entirely to the obtaining of it,—and for what purpose? In order that neither party should have an exclusive control over the ship canal. Can it be shown that the possession of British Honduras and the Bay Islands,—supposing the ship canal were completed, and it is not yet begun—would give the British Government an exclusive control over it—a control not being prohibited, but only an exclusive one? A glance at the map will satisfy any one of the absurdity of such a notion. If the governments of France and Great Britain were to co-operate in the construction of a railway through Spain, and it was agreed by treaty that neither party should obtain or exercise any dominion which would give an exclusive control over that railway, the Emperor of France might just as well insist upon our giving up the Isle of Man, as the government of the United States call upon us to give up the British settlement of Honduras or the Bay Islands under the Bulwer and Clayton treaty. But suppose we were to abandon our claim to those territories, to whom should we give them? To the Americans? that would be an infraction of the treaty. To old Spain? she cannot keep what she has already got. There is only one other state that can have a shadow of a pretension to it,—that is Guatimala. But Guatimala acknowledges our right, and sends a consul to Belize. To whom should we give the Bay Islands? It is well known that they never were in the possession of any one of the states of Central America. Ages ago they were found unoccupied, and taken possession of by the English, in the name of the British crown. But Mr. Cass says that they have been colonised since 1850. Never was there a greater error; it can be distinctly proved that, in the year 1741, commissioners were appointed by George II. for the Government of the islands of Ruatan and Bonacca.

I think that, so far, I have shown, taking into consideration its design and object, that we have not violated the Clayton and Bulwer treaty. But they say that, in continuing our protection to the king of the Mosquito Indians, we are violating that treaty. Now, what does the treaty say upon this point? "nor will either make use of any protection which either affords, or may afford, or any alliance which either has, or have, with any state or people." From this it is clear that a protection is not prohibited. It goes on, "for the purpose of erecting or maintaining any such fortifications, or of occupying, fortifying, or colonising Nicaragua, Costa Rica, the Mosquito coast, or any part of Central America, or of assuming, or exercising dominion over the same." This part of the article, Mr. Clayton, Mr. Cass, and the rest of them, say we have violated, inasmuch as we continue to extend our protection to the King of the Mosquito Indians. But is it not as plain as the sun in the heavens, that the article does *not* prohibit such protection, but that it prohibits the making use of that protection for the purpose of raising fortifications, &c. When, then, it can be shown, that the British Government makes use of the protection which it gives to the King of the Mosquito Indians, *which protection the treaty permits*, "for the purpose of erecting fortifications, or of occupying, fortifying, or colonising Nicaragua, Costa Rica, the Mosquito Coast, or any part of Central America, or of assuming or exercising dominion over the same;" when, I say, it can be shown that the British Government have made use "of the protection which it affords, or may afford" to the Mosquito king, to do all or any of these things, then let them say that the treaty has been violated. But nothing of the kind has been done. The protection, which by the treaty we are allowed to extend to the Mosquito king, has never been "made use of" for any one of these purposes. I have already said, that the sole object of the treaty was to prevent either party from obtaining a monopoly of, or an undue control over, the ship canal. The treaty is not *absolute*, but *relative*, and the thing to which it relates is the ship canal. Take away that thing, and it falls to the ground. It has no existence without it. Wherever the canal is, there the treaty will be in force. Where, then, is the canal? In Utopia—or in that particular planet which is set apart for the reception of discarded projects, which, doubtless, is the "fool's paradise" which Milton sung. There, also, is the treaty. It is utterly impossible to view the subject in any other light. If I agree with my good friend and neighbour farmer Tomkins, to cut a canal across a certain part of the country to an adjacent town, in order that we may have a cheap and expeditious mode of sending our pigs and poultry to market; and, to prevent either of us from having an exclusive use of such canal, we mutually covenant that we will not purchase any of the land through which it shall pass, and afterwards the undertaking is abandoned, either because there are insurmountable difficulties in the way, or because another channel has been considered preferable, can it be said that I am precluded from purchasing or otherwise acquiring the possession of a turnip field through which the canal would have flowed had that canal been dug? I do not think that any court of justice in the world would so decide. I am quite sure that the Governor of Baratraria, whose enlightened judgments have met with an able and correct reporter, would not have been of that opinion.

The Clayton and Bulwer treaty was a conditional obligation, and the ship canal was the suspensive condition. If that condition was not accomplished there was no obligation. Pothier says, "The effect of a condition is to suspend the obligation until the condition is accomplished or considered as accomplished; till then nothing is due. There is only in expectation that what is undertaken will be due, *pendente conditione nondum debitur, sed spes est debitum iri.* Therefore, a payment made by mistake before the accomplishment of the condition, is subject to repetition, &c." Vattel, writing on the "interpretation of treaties," says, "The reason of the law, or the treaty, that is *the motive which led to the making of it, and the view there proposed*, is one of the most certain means of establishing the true sense, and great attention ought to be paid to it whenever it is required to explain an obscure, equivocal, and undetermined point, either of a law or of a treaty, or to make an application of them to a particular case. As soon as we certainly know the reason which alone has determined the will of him who speaks, we ought to interpret his words, and to apply them in a manner suitable to that reason alone, otherwise he will be made to speak and act contrary to his intention, and in a manner opposite to his views. In virtue of this rule a prince who, on granting his daughter in marriage, has promised his future son-in-law succours in all his wars, owes him nothing if the marriage does not take place." I ask, then, what was the motive which led to the making of the Bulwer and Clayton treaty; what was the view which the contracting parties then proposed? The motive was, as I have before stated, the furtherance of a great commercial undertaking—the accomplishment of a noble work, which should be a perpetual monument of the energy and enterprise of two great nations, and the prevention of either party from having an "exclusive control over that work." It follows, then, from what has been said, that if the work itself falls to the ground, the treaty, as a necessary consequence, must go along with it. "We will not acquire such dominion as will give us an exclusive control over the canal." That is what we say. We do not say we will relinquish all the dominions and territories which we already possess, which are not calculated to give an exclusive control over the said canal, neither do we bind ourselves not to acquire in future any dominion which is not calculated from its nature and position to give us that control. The interpretation which certain American statesmen and writers put upon the Clayton and Bulwer treaty is a forced one—it is an interpretation which the plain, obvious sense of its language will not justify. There is no question that they take a mistaken view of it. But some of their own journalists ascribe to them motives and conduct of which I, who entertain a high opinion of the morality of the public men of the United States, cannot believe them capable. But, whether capable or not, it is a proof, at all events, that even in America all do not think alike upon this subject. The *New York Tribune* says, "For our own part we believe that it never was the intention or expectation of the British negotiator of the treaty to surrender the protectorate of Great Britain over the Mosquitos. We believe that Mr. Clayton never approached this topic in his negotiations with Mr. Bulwer, knowing full well the position which that minister occupied on that point, but that he cautiously avoided it, intending to obtain by indirection and diplomatic wiles what he knew would not be knowingly yielded in unequivocal terms. We have reason to believe that Mr. Clayton chuckled not a little at what he deemed his success over the British diplomatist, and was not altogether complimentary in the terms he applied to the astuteness of that functionary."

If this be true of Mr. Clayton, which I for one do not believe, comment upon such conduct would be unnecessary.

Mr. Bright, in a speech which he lately made at the Manchester Chamber of Commerce, said:—"We have got a small town of 400 or 500 houses, called Belize, at the mouth of the river Belize, and two small islands, which are, perhaps, of no value at all." As I am quite sure that that gentleman would not knowingly make a misstatement, he will not be angry if I set him right upon this matter. Belize contains a ranging population of from 5,000 to 8,000 inhabitants; it stands upon a very large space of ground, and possesses, at the lowest computation, 1,500 houses. There are two handsome churches belonging to the Establishment, a Roman Catholic Chapel, a Baptist Chapel, and a Wesleyan Methodist Chapel. The houses of the respectable portion of the inhabitants are, for the most part, large and elegant structures, having wide verandahs in front. The streets are clean, wide, and airy, and the general appearance of the place, particularly if viewed from the harbour, shaded as the variously-coloured houses are by waving cocoa nut trees, with here and there a tall mountain cabbage, is picturesque and pleasing. A very extensive trade is carried on in Belize, and it is the *entrepot* for nearly all the dry goods which are imported into the neighbouring state of Honduras. Some of them also find their way to the other states. Fortunes have been very rapidly made in this town. A few years ago a Frenchman, called Eugene Rayal, came to Belize; he had no money, nor property of any sort, except a small diorama, which he went about exhibiting. A gentleman had a dinner party, and to amuse his guests he sent for Monsieur (the Creoles called him "Mushy") to exhibit his diorama. Mushy came, and, after the show was over, got into conversation with the gentleman of the house, in the course of which it transpired that he was well acquainted with the mystery of bread-baking; he was advised to discard the diorama, as a vain show, and rely for a subsistence upon the more substantial staff of life.

The counsel was good, and he adopted it, the aforesaid gentleman advancing him a sum of money to enable him to commence operations. Mushy made excellent bread, and, in a short time, none but his would go down. Whilst he was thriving in the "floury paths" of bread-baking, having arrived at the dignity of "master of the rolls," it accidentally became known that he had an equal genius for the *cuisine*. His talents in that department were immediately put in requisition, and he gave so much satisfaction that no dinner was considered perfect without some of Mushy's artistic "combinations." Months rolled on, and Mushy had a store well stocked with all kinds of good things. A few more months, and Mushy's wife suddenly started into existence. A few more, and there was another store, and yet another, and Mushy was growing laterally in a most surprising manner. But, to make a long story short, as an Irishman would say, in a few years Mushy was able to retire from business with a sum not far short of £10,000. He went to New Orleans and bought houses, in which city he now lives in great comfort and rotundity. He occasionally visits Belize, however, where he has established a son in business. As Monsieur Rayal, wearing a shiny black hat, with umbrageous brim, a glossy coat, of the most approved Yankee cut, a white waistcoat, and a gold chain, which would serve as a cable for a moderate-sized vessel, and with a broad grin upon his honest expansive face, he offers, in full confidence that it cannot be rejected, his fat hand to be shaken by those whose dinners he formerly cooked for a "consideration." Another Frenchman, whose name was Bessard, left Belize a short time ago, having cleared in three years £12,000. These are only two instances. I could mention many others. A place, then, cannot be so very paltry, in which men, such as I have mentioned, can raise themselves, by honest industry, from nothing to a very comfortable position, in so short a space of time. The amount of the exports and imports, and the quantity of shipping employed in the Honduras trade, will best show whether or not Mr. Bright was justified in sneering at Belize, and recommending the British Government to abandon it, and the *Times* newspaper in calling it a "worthless settlement." In the year 1853, the total amount of the exports from Honduras to Great Britain, the United States, and other countries, was £345,377. In 1854, the total amount was £452,313. In 1853, the total amount of outward ships was 23,936 tons. In 1854, it was 27,803 tons. The number of men employed in the former year was 990; in the latter, 1,132. In 1854, the total amount of the imports was £2,417,642. The inward ships in that year from Great Britain, the United States, and other countries, amounted to 31,124 tons, and the number of men employed was 1,259. Now, I think that a place employing such an amount of British shipping, and importing manufactured articles, principally British, to the amount of nearly two millions and a half yearly, is not altogether to be despised.

During this Central American controversy, British Honduras has been termed the "Belize settlement." That settlement, however, extends from the Rio Hondo on the north as far as the river Sarstoon on the south, being a distance of at least 250 miles of sea-coast, and it is believed to extend backwards 150 miles. Why, then, is this to be called a "worthless settlement?" I have no hesitation in saying, from the great number of splendid rivers which it contains,—from its stores of vegetable wealth of spontaneous growth,—from its immense forests in which most valuable woods are found,—from the richness and variety of its soil,—that it is equal in importance to any other colony belonging to Great Britain. Then, again, why speak in such disparaging terms of the Bay Islands? These islands, as I said before, are three in number, viz., Ruatan, Bonacca, and Utila. Ruatan is the principal one. It is about twenty-two miles in length, and about eight or nine in breadth. It is a very beautiful and fertile island, and contains at present not less than 3,000 inhabitants. A considerable trade is carried on between it and New Orleans in plaintains, cocoa nuts, and oranges.

I have the honour to be, Sir,
Your very obedient servant,
R. TEMPLE, Chief Justice.

Home Correspondence.

BOYDELL'S TRACTION STEAM-ENGINE FOR AGRICULTURAL PURPOSES.

Sir,—I devoted two days last week to the examination of the operation of this machine as a locomotive and tractive power, and have come to the conclusion that it is "a great success." This success is owing to the endless and wide railway attached to the circumference of the wheels, which gives a fulcrum for the lever, and a bearing sufficiently wide to carry a great weight on soft ground without imbedding in the soil. Hence the avoidance of friction and clogging; we might illustrate this by a sportsman on the mud oozes, whose feet would sink in, and thus render his power unavailable, but by attaching to his feet wide pieces of board, the pressure is diminished to a bearing condition. Thus, in the case of Mr. Boydell's machine, although it weighed nine tons, its impress was scarcely perceptible where a horse's foot left a deep indentation. This is a most important desideratum, seeing that weight in a traction engine is indispensable. We can form some idea of the value of this implement when we reflect that a common portable agricultural threshing engine, which only weighs three tons, requires two horses to draw it on the common road, while two more are required to draw the thrashing machine.

Mr. Boydell's engine walked from Camden-town to Acton, taking in tow its four-wheel waggon, with coals, and four heavy iron ploughs, and water enough for four hours' work. When on the soft turnip-field (after a night's rain) it drew after it ploughs, scarifier, &c., with perfect ease, and then walked home again to Camden-town.

It can ascend an acclivity of one in three, which is nearly walking up stairs, our stairs being one in two. It can back, advance, or stop instantaneously, the pinion being shifted from the cogs of the driving-wheel, and the power thus suddenly released is carried off by a separate fly-wheel, which may be used for driving threshing-machines, mill-stones, or other purposes.

In fact, instead of a farmer sending for and sending back a 6-horse power engine and threshing machine, requiring in each trip four horses, this machine will move itself any where—draw the corn to market, bring home manure, and do the cultivation and work of the farm.

I hope a company will be formed for its development, Mr. Boydell having expended nearly ten thousand pounds in accomplishing his object.

A full description of it is given in the *Mark Lane Express* of the 7th instant. It may briefly be described as a horizontal engine, mounted on wheels, with a man to steer in front and the engineer behind. The two cylinders were 6½ by 10, worked at 60lbs. per inch, with a quick movement, and estimated at 16 horse power. 20lbs. of steam was required to keep the machine moving, the other 40lbs. for traction. Messrs. Boydell and Glazier's works are at Camden Works, Camden road. The machine can turn as easily as a common waggon, and does not mind a deep furrow or a side hill. It will evidently require a sort of railway buffer spring at starting, to avoid breaking the chains which attach it to its load.

I am, Sir, your obedient servant,
J. J. MECHI.

Tiptree-hall, Kelvedon, Essex, 10th April, 1856.

P.S. It was a remarkable and significant fact, that although public notice in the papers had been given of the intended trial at Acton, there were very few members of either the London Farmers' Club or Royal Agricultural Society present. I hear that Messrs. Garrett and Sons made the engine that drove the machine. Mr. Boydell told me that on its return journey it was met by a waggon-load of grain drawn by six horses. The horses swerved at the sight of the machine, and drew the wheels into a soft place, from which seven horses could not extricate it; but he hooked on the traction engine, and drew it out with ease.

TEST OF STEEL MANUFACTURES.

SIR,—Your last number contains a singular letter from "Chalybs," on a variety of subjects more or less connected with steel manufactures. I shall not follow the writer through the *multifariousness* of his epistle. Neither shall I enlighten your readers on "rattening," that not forming any part of the paper read before your Society in the presence of "Chalybs." On one subject, however, I will offer a few remarks, to remove any wrong impression that may exist either in the minds of your readers or that of your correspondent. The latter appears to think that education lessening the number of the ignorant, will be the surest check to the system of imposition, which, in common with others, he deprecates. Now, I distinctly stated that there did not exist any popular test to judge of the quality of steel manufactures. And I humbly submit that the education he suggests can never become popular or common. Everybody who desires that knowledge must be intimately acquainted with the details of manufacture, which is quite impossible to any considerable portion of mankind.

By way of testing the point, I beg to forward to you three specimens of polished steel articles. Now, let "Chalybs," or any "educated" man, point out the best of the three, and also state the defects of the other two, assuming that they are not all equally good. Or let him point out the bad one, and tell me the good properties of the remainder. The articles are marked respectively I, II, III. I place the key of their qualities in your hands, and await the judgment of the "educated" men.

Yours, &c.,
JAMES WILSON.

Sheffield, April 15, 1856.

To Correspondents.

ERRATA in last number, in Mr. Mechi's remarks, page 362, col 2, line 39, for "steel pins" read *steel pens;* and page 363, col. 1, line 12 from bottom, for "unwise enough to *lose* the importation, &c.," read "unwise enough to *tax* the importation, &c."

MEETINGS FOR THE ENSUING WEEK.

MON. London Inst., 7, Dr. Lankester, "On the Recent Progress of Vegetable Physiology."
Chemical, 8.
Statistical, 8, Mr. W. B. Hodge, "On the Mortality arising from Military Operations."
Royal Inst., 9, Dr. Sandwith, "On the Siege of Kars."
TUES. Royal Inst., 3, Professor Huxley, "On Physiology and Comparative Anatomy."
Syro-Egyptian, 7½, Anniversary.
Civil Engineers, 8, Mr. F. M. Kelley, "On the Junction of the Atlantic and Pacific Oceans, by a Ship Canal through the Valley of the Atrato."
Medical and Chirurgical, 8½.
Zoological, 9.
WED. Antiquaries, 2, Anniversary.
London Inst., 3, Professor Rymer Jones, "On Entomology, and the General Organisation and Metamorphosis of Insects."
Royal Society of Literature, 3, Anniversary.
Society of Arts, 8, Herr Paul Pretsch, "On Photo-Galvanography, or Engraving by Light and Electricity."
Geological, 8, Mr. G. P. Scrope, "On the Formation of Craters, and the Nature of the Liquidity of Lavas."
THURS. Royal Inst., 3, Prof. Tyndall, "On Light."
Numismatic, 7.
Royal, 8½.
FRI. Philological, 8.
Royal Inst., 8½, Mr. W. B. Donne, "The Works of Chaucer considered as Historical Illustrations of England in the 14th Century."
SAT. London Inst., 3, Mr. E. W. Brayley, "On Geology."
Royal Inst., 3, "Dr. A. W. Hofmann, "On the Non-Metallic Elements, their Manufacture and Application."
Royal Botanic, 3¾.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 10th April, 1856.

Par. No.
90 (6). Civil Services Estimates—Class 6.
109. Compulsory Vaccination—Copy of a Letter by John Gibbs, Esq.
139. Ionian Islands—Return.
141. Bay Islands—Return.
Medical Charities (Ireland)—4th Report of the Commissioners.

Delivered on 11th April, 1856.

41. Local Acts (26, Cork Bridges, Waterworks, and Improvement; 27, Perth Burgh and Harbour)—Admiralty Reports.
140. Tasmania—Correspondence.

Delivered on 12th and 14th April, 1856.

129. Court of Chancery (Suitor's Fund)—Return.
133. East India—Return.
142. Public Income and Expenditure (Year to 31st March, 1856)—Account.
144. Judicial Bench (Ireland)—Return.
147. British Museum—Accounts.
145. Vaccination—Return.
84. Bills—Poor Law Amendment.
91. Bills—Medical Qualification and Registration.
93. Bills—Dissenters' Marriages (amended).
94. Bills—Education (Scotland).
95. Bills—Parochial Schools (Scotland).
96. Bills—Poor Law (Ireland).
Prisons—18th Report of the Inspectors (Northern and Eastern District)—Part 2.

Delivered on 15th April, 1856.

138. Commissariat Accounts—Return.
97. Bill—Agricultural Statistics.

Delivered on 16th April, 1856.

112. Superannuation (Public Office)—Account.
143. Poor Laws (Ireland)—Return.
Public General Acts—Cap. 11, 12, 13, 14, 15, and 16.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette April 11th*, 1856.]

Dated 25th March, 1856.

702. John Bromley, Shelton, and William Adams, Etruria—Improvements in ovens used for firing porcelain and other kinds of earthenware.
704. John Aspinall, Limehouse—Improvements in apparatus for obtaining extracts and decoctions.
706. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in machinery or apparatus for raising nap or pile. (A communication.)
708. George Hallen Cottam and Henry Richard Cottam, Old St. Pancras-road—Improvements in the manufacture of chairs, bedsteads, and other articles to sit and recline on.
710. George Hedgcombe Smith, North Perrot, near Crewkerne—Improvement in the manufacture of saucepans, kettles, and other like culinary utensils.
712. Robert Collins, Trent—Improved agricultural implement.
714. George Wailes, 10, Palace-row, New-road—Improvements in the means of actuating valves used for regulating the passage of gas or water in pipes.

Dated 26th March, 1856.

715. Matthew Weston and Orlando Carter, Rochdale—Improvements in machinery or apparatus for setting saws.
716. Joseph Liley, 5, Gutter-lane—Improved case or sliding-tube for candles, telescopes, opera-glasses, and is especially applicable to portable articles for the toilet in travelling, and is called 'Debas-cylindrical-etui.' (A communication.)
717. Alexandre Tolhausen, 7, Duke-street, Adelphi—A new process of producing chemical writing, and of marking and inscribing chemically any characters or figures upon paper or other substance of similar character. (A communication.)
718. Alexandre Tolhausen, 7, Duke-street, Adelphi—Improved mode of manufacturing porous earthenware. (A communication.)
719. William Armand Gilbee, 4, South-street, Finsbury—Improvements in the manufacture of glass. (A communication.)
720. Thomas Barnabas Daft, Seville Iron Works, Dublin—Improvements in the manufacture of metallic and other bedsteads and articles of metallic and other furniture.
721. David Lowe, Leicester—Improvements in knitting machinery.
722. George Smith, 9, Manor-road, Newington—Improvements in 'envelopes' for containing letters or documents.
723. Patrick Scott Rankin, Glasgow—Improvements in communicating or transmitting motive power.
724. William Robert Barker, Chapel-street, and William Toogood, Mount-street—Improvements in bottles, or in stoppering bottles, jars, and other receptacles.
725. James Rock, jun., Hastings—Improvements in carriages, parts of which are applicable to other structures.
726. William Edward Newton, 66, Chancery-lane—Improved apparatus for exploring under water. (A communication.)
727. Wm. Clayton, Watling-street—Improved manufacture of soap.
728. William Edward Newton, 66, Chancery-lane—Improvements in macerating substances to be employed in the process of distillation. (A communication.)

Dated 27th March, 1856.

729. James Taylor and James Galloway, Bolton-le-Moors—Improvements in gauges for indicating pressure.
730. Alexandre Tolhausen, 7, Duke-street, Adelphi—Improvements in watches and other time keepers. (A communication.)
731. Joseph Tall, Islington—Improvements in blind rollers, and in fixings for the same.
732. William Nicholls, Raunds, Northampton—Improvement in the manufacture of boots and shoes.
733. Richard Durant Cumming, St. James's, Middlesex—A footstool and hassock combined. (A communication.)
734. Bonnet Fréderic Brunel, Hampstead-road—Improvements in the manufacture of prussian blue.
735. James Cliff, Burton-upon-Trent—Improvements in machinery for cleansing casks.
736. William Ball, Chicopee, Hampden, U.S.—Improvements in machines for separating copper and other metals from their ores.
737. Allen Levinston Hill, Birmingham—Improvements in furnaces for steam-boilers, japanners' stoves, and other such like purposes.
738. Edward Bufton, 122, Piccadilly—Improved ink for marking linen and other fabrics, and in the case or holder for containing the same and the implements to be used therewith.
740. William Frederick Thomas, St. Martin's-le-Grand—Improvements in sewing machines.

Dated 28th March, 1856.

741. Joseph Auguste Barratt, 39, Rue de l'Echiquier, Paris—A new rotatory steam-engine.
742. John Conrad Meyer, Paris—Improvements in the construction of vices.
743. William Ward, Warrington—Improvements in apparatus for lubricating the spindles of certain machines, and in preparing and spinning.
744. Alfred Daniel, Moorfields, Wolverhampton—Improvements in the manufacture of keys and locks.
745. Joseph Webber, Torquay—Improvements in generating steam.
746. John Charritie, Cannon-street, and William Smith, 10, Salisbury-street, Adelphi—Improvements in the manufacture of small shot. (A communication.)
747. James Harrison, Geelong, Victoria—Producing cold by the evaporation of volatile liquids in vacuo, the condensation of their vapours by pressure, and the continued re-evaporation and re-condensation of the same materials.
749. James Harrison, Geelong, Victoria—Distilling or evaporating in vacuo condensing the vapour by pressure, and economising heat.
750. Alfred Trueman, Swansea—Improvements in treating argentiferous regulus.
751. Alfred Vincent Newton, 66, Chancery-lane—Improved air engine for producing motive power by heated air. (A communication.)

Dated 29th March, 1856.

753. Charles Wye Williams, Liverpool—Improvements in the application of air propelling or exhausting apparatus for ventilating and like purposes on board steam vessels.
755. Francis Puls, Soho-square—Improvements in galvanic batteries.
757. Robert Powell, 2, Peter's-place, Saint Martin's-lane—A new method of making up cotton, linen, silk, woollen, and other textile fabrics, whether waterproofed or not, into wearing apparel, horse clothing, tents, tilts, and all other articles or things for which such fabrics are used, by which method the article or thing when made up and worn is perfectly ventilated.
759. William Muschamp, Tyne Paper Mill Company, Gateshead—Improvement in the manufacture of paper in order to render the same waterproof.
761. John McLean, Glasgow—Improvements in treating or preparing textile fabrics and materials for increasing the density thereof.
763. William Nimmo, Pendleton—Improvements in the manufacture of textile fabrics.

WEEKLY LIST OF PATENTS SEALED.

Sealed April 11th, 1856.

2273. William Andrew Fairbairn and George Haslam.
2275. Peter Spence.
2288. James Septimus Cockings and Ferdinand Potts.
2303. Samuel Kent.
2317. Henry Bessemer.
2319. Henry Bessemer.
2321. Henry Bessemer.
2323. Henry Bessemer.
2325. Henry Bessemer.
2327. Henry Bessemer.
2333. Charles Edwin Jones.
2399. Simon O'Regan.
2423. William Henry Walenn.
2451. Robert Cook.
2481. George Burridge.
2511. Charles Allen Browne.
2653. Charles Sanderson.
2881. Evan Evans.
2883. Philip Antrobus.
2905. Isaac Atkins and Marmaduke Miller.
91. Charles François Leopold Oudry.
121. David Dring.
129. William Chapman.
243. Samuel Palmer Gladstone.
297. Rudolph Bodmer.
307. George Cumins Thomas.
423. William Aristides Vérel.

Sealed April 15th, 1856.

2302. Thos. Weatherburn Dodds.
2304. Robert Benton.
2310. William Church.
2311. Edwin Wilkinson.
2312. John Forrest.
2314. Théodore Augustin Claeijs.
2329. John Talbot Pitman.
2330. Thomas Taylor.
2331. John Adcock.
2332. Thomas Richards Harding.
2350. Thomas Craven & Matthew Pickles.
2356. Hypolyte Gaudibert.
2370. Thomas Roberts and John Dale.
2448. John Cottrill.
2490. Richard Goose.
2702. Edward Daniel Johnson.
2703. Auguste Dusautoy.
2. Ferdinand Swift.
268. John Barker Anderson.
326. Franklin Prestage.
416. Stephen Fitchew Cox.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

April 7th.

886. Nathaniel Clayton and Joseph Shuttleworth.
912. David Zenner.
942. John Chatterton.

April 9th.

917. William Wilkinson.
967. William Edward Newton.

April 10th.

889. Thomas Edwards.
962. George Albemarle Cator.
928. Henry Wilks.
962. Henry Carr.

April 11th.

895. Charles Clifford.
897. Thomas Lovell Preston.
901. John Chadwick and Thomas Dickins.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3826	April 10.	Insect Trap	Eliezer Edwards	Birmingham.
3827	April 12.	Improved Pressure Guage	Richard Pease	Bradford, Yorkshire.
3828	April 15.	Guard for Penholder	James Lowe and............ Maurice Pollock............	Birmingham.
3829	April 16.	Reclining Chair	John Manuel	Sheffield.